

**U.S. FISH AND WILDLIFE SERVICE
SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM**

SCIENTIFIC NAME: *Cyanea tritomantha*

COMMON NAME: 'Aku

LEAD REGION: Region 1

INFORMATION CURRENT AS OF: April 2010

STATUS/ACTION

☐ Species assessment - determined we do not have sufficient information on file to support a proposal to list the species and, therefore, it was not elevated to Candidate status

☐ New candidate

☒ Continuing candidate

☐ Non-petitioned

☒ Petitioned - Date petition received: May 11, 2004

☐ 90-day positive - FR date:

☒ 12-month warranted but precluded - FR date: May 11, 2005

☐ Did the petition request a reclassification of a listed species?

FOR PETITIONED CANDIDATE SPECIES:

a. Is listing warranted (if yes, see summary of threats below)? Yes

b. To date, has publication of a proposal to list been precluded by other higher priority listing actions? Yes

c. If the answer to a. and b. is "yes", provide an explanation of why the action is precluded.

Higher priority listing actions, including court-approved settlements, court-ordered and statutory deadlines for petition findings and listing determinations, emergency listing determinations, and responses to litigation, continue to preclude the proposed and final listing rules for the species. We continue to monitor populations and will change its status or implement an emergency listing if necessary. The "Progress on Revising the Lists" section of the current CNOR (<http://endangered.fws.gov/>) provides information on listing actions taken during the last 12 months.

☐ Listing priority change

Former LP: ☐

New LP: ☐

Date when the species first became a Candidate (as currently defined):

October 25, 1999

☐ Candidate removal: Former LP: ☐

☐ A – Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or

continuance of candidate status.

- ___ U – Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species.
- ___ F – Range is no longer a U.S. territory.
- ___ I – Insufficient information exists on biological vulnerability and threats to support listing.
- ___ M – Taxon mistakenly included in past notice of review.
- ___ N – Taxon does not meet the Act’s definition of “species.”
- ___ X – Taxon believed to be extinct.

ANIMAL/PLANT GROUP AND FAMILY: Flowering plants, Campanulaceae (Bellflower family)

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE: Hawaii, island of Hawaii

CURRENT STATES/COUNTIES/TERRITORIES/COUNTRIES OF OCCURRENCE: Hawaii, island of Hawaii

LAND OWNERSHIP: Approximately 85 percent of the statewide population of this species is known from State land: Puu O Umi, Laupahoehoe, and Puu Makaala Natural Area Reserves (NARs), Upper Waiakea, Olaa, and Kohala Watershed Forest Reserves (FRs), and Department of Hawaiian Homes Land (DHHL). Smaller populations are also known from federal (Hawaii Volcanoes National Park) and private lands.

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LEAD FIELD OFFICE CONTACT: Pacific Islands Fish and Wildlife Office, Christa Russell, 808-792-9400, christa_russell@fws.gov

BIOLOGICAL INFORMATION

Species Description

Cyanea tritomantha is a palm-like tree 6 to 10 feet (ft) (1.8 to 3 meters (m)) tall. Leaves are oblong to oblanceolate or obovate, with blades 15 to 37 inches (in) (38 to 95 centimeters (cm)) long and 4.3 to 7.9 in (11 to 20 cm) wide, the upper surface green and glabrous, and the lower surface pale green and pubescent with sharp projections along the midrib. Inflorescences are 5 to 20-flowered and clustered among the leaves. The hypanthium is obconical, 4.3 to 7.9 in (10 to 14 millimeters (mm)) long, and 0.2 to 0.3 in (5 to 8 mm) wide. The calyx lobes are narrowly triangular, 0.04 to 1.0 in (1 to 25 mm) long, and 0.06 to 0.12 in (1.5 to 3 mm) wide. The corolla is blackish purple or greenish white externally, pale-bluish white within, 2.4 to 3.0 in (60 to 75 mm) long, 0.2 to 0.24 in (5 to 6 mm) wide, and densely pubescent. Berries are orange, ellipsoid, 0.6 to 1.0 in (15 to 25 mm) long, 0.4 to 0.9 in (10 to 22 mm) in diameter, and crowned by the persistent calyx lobes (Lammers 1999, p. 466).

Taxonomy

Cyanea tritomantha was described by Asa Gray (1861). This species is recognized as a distinct taxon in Wagner and Herbst (2003), the most recently accepted Hawaiian plant taxonomy.

Habitat/Life History

Cyanea tritomantha is found in *Metrosideros-Cibotium* (ohia-hapuu) montane wet forest with the following associated species: *Acacia koa* (koa), *Broussaisia arguta* (kanawao), *Cheirodendron trigynum* (olapa), *Cyrtandra* spp. (haiwale), *Freycinetia arborea* (ie ie), *Pritchardia* spp. (loulou), and *Psychotria* spp. (kopiko), at elevations between 1,320 and 4,100 ft (402 and 1,250 m). *Cyanea tritomantha* is also found in *Acacia-Metrosideros* (koa-ohia) lowland wet forest with *Antidesma* spp. (hame), *Cibotium* spp., *Diplazium sandwichianum* (hoio), *Hedyotis terminalis* (manono), *Perrottetia sandwicensis* (olomea), and *Psychotria* spp. (kopiko), at elevations of 3,320 to 4,920 ft (1,012 to 1,500 m) (Hawaii Biodiversity and Mapping Program (HBMP) 2008).

Historical Range/Distribution

Historically, collections of this species were made from wide ranging areas in wet forest from the Kohala mountains south to the Olaa Forest and Kau on the island of Hawaii (HBMP 2008).

Current Range/Distribution

Currently, *Cyanea tritomantha* is known from the Puu Makaala, Olaa, Upper Waiakea Forest, Hawaii Volcanoes National Park, and Kau regions of the central and southern portion of the island of Hawaii (N. Agorastos, DOFAW, pers. comm. 2010; S. Perlman, NTBG, pers. comm. 2010). It is also known from Laupahoehoe on the windward slopes of Mauna Kea and from the Kohala mountains in the northern portion of the island (L. Pratt, U.S. Geological Survey, Biological Resources Discipline (USGS-BRD), pers. comms. 2007, 2008; HBMP 2008).

Population Estimates/Status

Currently there are 16 populations of *Cyanea tritomantha* that total fewer than 300 wild individuals. Populations are known from nine locations in the Kohala mountains totaling between 86 and 136 individuals. Approximately 6 to 10 individuals are known from two locations in the Laupahoehoe NAR. At Puu Makaala there are about 40 individuals (with 300 outplanted) (L. Perry, Hawaii Division of Forestry and Wildlife (DOFAW), pers. comm. 2006; S. Perlman, NTBG, in litt. 2008; N. Agorastos, pers. comm. 2010; S. Perlman, pers. comm. 2010). In Hawaii Volcanoes National Park there are 11 individuals in the Koa and Ag Units, and seven individuals in the Olaa Tract, with 69 outplanted (HBMP 2008; T. Belfield, National Park Service (NPS), pers. comm. 2007). Four individuals have been outplanted into a fenced enclosure at the State's Upper Waiakea FR (L. Perry, pers. comm. 2006). One plant is known from private land in the Kau region of the island (HBMP 2008).

THREATS

A. The present or threatened destruction, modification, or curtailment of its habitat or range.

Cyanea tritomantha is threatened by feral pigs (*Sus scrofa*) and cattle (*Bos taurus*) that degrade and destroy habitat (HBMP 2008). Evidence of the activities of feral pigs has been reported in six of the known locations where *Cyanea tritomantha* exists (Laupahoehoe, Puu O Umi, and Puu

Makaala NARs, and Olaa, Upper Waiakea, and Kohala FRs) (HBMP 2008; L. Perry, pers. comm. 2006). Cattle have been reported from the Kohala FR (HBMP 2008; L. Perry, pers. comm. 2006).

Pigs of Asian ancestry were introduced to Hawaii by the Polynesians, and the Eurasian type was introduced to Hawaii by Cook in 1778, with many other introductions thereafter (Tomich 1986, p. 121). Some pigs raised as food escaped into the forests of Hawaii, Kauai, Oahu, Molokai, Maui, and Niihau, formed herds, and are now managed as a game animal by the State to optimize hunting opportunities (Tomich 1986, p. 125; State of Hawaii 2001). In a study conducted in the 1980s on feral pig populations in the Kipahulu Valley on Maui, the deleterious effects of feral pig rooting on native forest ecosystems was documented (Diong 1982, 408 pp.). Kipahulu Valley consists of a diverse composition of native ecosystems, from near sea level to alpine, and forest types ranging from mesic to wet, *Acacia koa* and/or *Metrosideros polymorpha*, which is similar to the habitat of *Cyanea tritomantha* on the island of Hawaii. Rooting by feral pigs was observed to be related to the search for earthworms, with rooting depths averaging 8 in (20 cm), greatly disrupting the leaf litter and topsoil layers, and contributing to erosion and changes in ground topography (Diong 1981, pp. 143-150). The feeding habits of pigs were observed to create seed beds, enabling the establishment and spread of weedy species such as *Psidium cattleianum* (strawberry guava) (Diong 1982, pp. 164-165). The study concluded that all aspects of the food habits of pigs are damaging to the structure and function of the Hawaiian forest ecosystem (Diong 1982, pp. 166-167). The effects on mesic and wet forest habitat by foraging of feral pigs have also been reported in fencing studies. In a fencing study conducted in the montane bogs of Haleakala, it was found that when feral pigs were fenced out of an area the cover of native plant species increased from 6 to 95 percent within six years of protection (Loope *et al.* 1991, pp. i, 13).

Cattle, the wild progenitors of which were native to Europe, northern Africa, and southwestern Asia, were introduced to the Hawaiian Islands in 1793. Large feral herds developed as a result of restrictions on killing cattle decreed by King Kamehameha I. While small cattle ranches were developed on Kauai, Oahu, and west Maui, very large ranches of tens of thousands of acres were created on east Maui and Hawaii. Feral cattle can presently be found on the islands of Hawaii and Maui, and ranching is still a major commercial activity. Cattle eat native vegetation, trample roots and seedlings, cause erosion, create disturbed areas into which alien plants invade, and spread seeds of alien plants in their feces and on their bodies. The forest in areas grazed by cattle becomes degraded to grassland pasture, and plant cover is reduced for many years following removal of cattle from an area. Several alien grasses and legumes purposely introduced for cattle forage have become noxious weeds (Tomich 1986, pp. 140-150; Cuddihy and Stone 1990, pp/ 59-63; Wagner *et al.* 1999, p. 72).

Hawaiian ecosystems, having evolved without hooved mammals, are susceptible to large-scale disturbance by pigs, cattle, and other introduced ungulates (Loope *et al.* 1991, p. 3). Because of demonstrated habitat modifications by feral pigs and cattle, such as destruction of native plants, disruption of topsoil leading to erosion, and establishment and spread of nonnative plants, the Service believes feral pigs and cattle are threats to *Cyanea tritomantha*.

B. Overutilization for commercial, recreational, scientific, or educational purposes.

None known.

C. Disease or predation.

Predation by feral pigs is a potential threat to *Cyanea tritomantha* in at least six of the known locations where this species exists (Laupahoehoe, Puu O Umi, and Puu Makaala NARs, and Olaa, Upper Waiakea, and Kohala FRs) (HBMP 2008; L. Perry, pers. comm. 2006). Predation by feral cattle is a potential threat to individuals of *C. tritomantha* in the Kohala FR (HBMP 2008; L. Perry, pers. comm. 2006). Browsing by ungulates has been observed on many native plant species, including common and rare or endangered species (Cuddihy and Stone 1990, pp. 63-67). Because Hawaii's native plants evolved without any browsing or grazing mammals present, many lost natural defenses to such impacts (Merlin and Juvik, p. 597). Pigs are omnivorous in their diet. In the study described above on feral pig populations in the Kipahulu Valley, pigs were observed browsing on young shoots, leaves and fronds of a wide variety plants, of which over 85 percent were endemic species (Diong 1982, 408 pp.). A stomach content analysis showed that the pigs' food sources consisted of native plants, 60 percent of which were tree ferns (*Cibotium* spp.), alternating with strawberry guava (*Psidium cattleianum*) when it was available. Pigs were observed to fell plants and remove the bark of *Clermontia*, *Cibotium*, *Coprosma*, *Psychotria*, and *Hedyotis* species (herbaceous and woody plants), with larger trees killed over a few months of repeated feeding (Diong 1982, pp. 138, 144). The ability of cattle to degrade native vegetation by grazing and trampling was recognized very soon after large-scale ranching began in Hawaii (Cuddihy and Stone 1990, pp. 59-63). Therefore, even though we have no evidence of direct browsing for *Cyanea tritomantha*, predation by feral pigs and cattle is a potential threat to this species.

Cyanea tritomantha is potentially threatened by predation by rats (*Rattus* spp.) and slugs (Gastropoda) (Wood *et al.* 2002; HBMP 2008). Rats are known to damage and preferentially eat the fleshy leaves, stems, and fruit of species in this genus (*Cyanea*) (J. Lau, Hawaii Natural Heritage Program (HNHP), pers. comm. 1994; L. Mehrhoff, Service, pers. comm. 1995; J. Yoshioka, (HNHP), pers. comm. 1994). Of the four species of rodents that have been introduced to the Hawaiian Islands, the species with the greatest impact on native flora and fauna is probably the black or roof rat (*Rattus rattus*), which now occurs on all the main Hawaiian Islands. Black rats, and to a lesser extent the house mouse (*Mus musculus*), the Polynesian rat (*R. exulans*), and the Norway rat (*R. norvegicus*), eat the fruits of some native plants, while black rats are reported to strip the bark from some native plants (Tomich 1986, pp. 37-45; Cuddihy and Stone 1990, pp. 33-34, 68-70).

Little is known about the predation of certain rare plants by slugs. New information in the U.S. Army's 2005 Status Report for the Makua Implementation Plan indicates that slugs can be a threat to all species of *Cyanea* (U.S. Army Garrison 2005, p. 2-1-23). An Army researcher is investigating potential methods to control slug herbivory. This research on slug impacts on *Cyanea* seedlings has revealed levels of mortality of approximately 53 percent (U.S. Army Garrison 2005, p. 2-1-23).

D. The inadequacy of existing regulatory mechanisms.

Pig hunting is allowed year-round, or during certain months, depending on the area (Hawaii Department of Land and Natural Resources 1999, 2003); however, public hunting does not adequately control the number of ungulates to eliminate this threat to native plant species. Hunting of feral cattle is no longer allowed in Hawaii (Hawaii Department of Land and Natural Resources 1985, p. 3) except under permitted conditions.

Cyanea tritomantha is not currently protected under Hawaii's endangered species law (HRS, Sect. 195-D) or the Federal Endangered Species Act (16 U.S.C. §1531-1544).

E. Other natural or manmade factors affecting its continued existence.

Numerous weed species threaten *Cyanea tritomantha* including: *Passiflora tarminiana* (banana poka), *Setaria palmifolia* (palm grass), *Tibouchina herbacea* (glorybush), *Hedychium gardnerianum* (kahili ginger), *Rubus rosifolius* (thimbleberry), and *Polygonum punctatum* (water smartweed) in the Kohala Forest and Laupahoehoe populations; and *Rubus rosifolius*, *R. ellipticus* (yellow Himalayan raspberry), *Polygonum punctatum* (water smartweed), *Clidemia hirta* (Koster's curse), *Psidium cattleianum* (strawberry guava), and *Setaria palmifolia* in the Olaa and Upper Waiakea Forest populations (HBMP 2008).

Clidemia hirta is a noxious shrub first cultivated on Oahu. This pest plant forms a dense understory, shading out native plants and hindering their regeneration, and is considered a major threat (Wagner *et al.* 1985, p. 41; Smith 1989, p. 189). The most promising biological control to date for Koster's curse is the *Colleotrichum* fungus, *Gloesporioides* f. sp. *clidemiae*, released in 1986. Although there is no quantitative data available, it has an observable negative impact. Other agents tested were a moth (*Antiblemma acclinalis*), a leaf-feeding beetle (*Lius poseidon*), a fruit and flower-feeding insect (*Mompha trithalama*), and a terminal growth-feeding insect (*Liothrips urichi*), all with lesser control success than the fungus (Smith 1989, p. 189).

Hedychium gardnerianum is native to the Himalayas and surrounding regions (Nagata 1999, p. 1,623). This showy ginger was introduced for ornamental purposes, and was first collected in 1954 at Hawaii Volcanoes National Park (Wester 1992, p. 124). Kahili ginger grows over 3 ft (1 m) tall in open light environments, preferring a warm moist climate; however, it will readily grow in full shade beneath a forest canopy (Smith 1985, pp. 191-192). It forms vast, dense colonies, displacing other plant species, and reproduces by rhizomes where already established. The conspicuous, fleshy, red seeds are dispersed by fruit-eating birds as well as man (Wester 1992). Aircraft-based analysis has found that ginger reduces the amount of nitrogen in the *Metrosideros* forest canopy in Hawaii, a finding later corroborated by ground based sampling (Asner and Vitousek 2005). It may also block stream edges, altering water flow (Global Invasive Species Database (GISD) 2005a). Kahili ginger can be controlled by herbicides, but biological control is considered the only practical approach for the long-term management of large infestations in native forests. The ability of the bacterium *Ralstonia* (= *Pseudomonas*) *solanacearum* to cause bacterial wilt in kahili ginger in the field, together with its lack of virulence in other ginger species, contributes to its potential as a biological control agent (Anderson and Gardner 1999, p. 95; Anderson 2003).

Passiflora tarminiana, a vine native to South America, is widely cultivated for its fruit (Escobar 1999). First introduced to Hawaii in the 1920s, it is now a serious pest in the mesic forest, where it overgrows and smothers the forest canopy. Seeds are readily dispersed by humans, birds, and feral pigs (La Rosa 1992, pp. 272-274, 281). Fallen fruit encourage rooting and trampling by pigs (J. Jeffrey, Service, pers. comm. 2007). Field releases of biocontrol insects have not been successful. Testing of fungi as biocontrol of this vine is ongoing (Gardner 2005; Wagner *et al* 1999, p. 1,012).

Polygonum punctatum is a perennial herb native to North and South America and the West Indies, and was introduced to Hawaii in 1909. This taxon established in Hawaii along streams, wet areas, and in disturbed forest (Wagner *et al.* 1999, p. 1,064). It grows in wetter areas or in shallow water, and has both floating and terrestrial forms. It can grow up to 30 in (76 cm) high, and can carpet large areas with its wide leaves. The achenes are spread by waterbirds, and it also spreads by rooting at the nodes. Handling of this vegetation can cause stings and burns (Earth Cards 2006; U.S. Geological Survey 2006).

Psidium cattleianum, a tree native to tropical America, has become widely naturalized on all the main islands of Hawaii. Found in mesic to wet forests, strawberry guava develops into dense stands in which few other plants can grow, displacing native vegetation. The fruit is eaten by pigs and birds, which then disperse the seeds throughout the forest (Smith 1985, p. 200; Wagner *et al.* 1985, p. 971). A biological control agent, *Tectococcus ovatus*, has undergone 15 years of testing, and there is a proposal to release this insect at Olaa Forest Reserve (ScienceDaily 2008).

Rubus ellipticus is native to India and widely grown as an ornamental in warm regions. This species has naturalized locally in the Volcano and Laupahoehoe areas of the island of Hawaii. It is a climbing shrub, covered with prickles and edible yellow fruit, and is readily dispersed by birds. This extremely thorny plant forms impenetrable thickets, threatening native ecosystems and the native Hawaiian raspberry species *Rubus hawaiiensis* (Benton 2005; GISD 2005b).

Rubus rosifolius is native to Asia and is common in Hawaii in disturbed mesic to wet forest on all of the main islands (Wagner *et al.* 1999, p. 1,110). It is a sparse shrub, covered with prickles, and has edible red fruit. It invades the forest understory, forms dense thickets, and outcompetes native plant species. It easily reproduces from roots left in the ground, and seeds are spread by feral animals and birds. There is no specific management information for *R. rosifolius*, but techniques used for the control of *R. fruticosus* (blackberry), a related species, may be applicable (Pacific Island Ecosystems at Risk 2006, Global Invasive Species Database 2006).

Setaria palmifolia is native to tropical Asia and was first collected on Hawaii Island in 1903 (O'Connor 1999, pp. 1,592-1,593). A large-leafed perennial herb, this species attains about 6.5 ft (2 m) in height at maturity, shading out native vegetation. Palmgrass is resistant to fire and recovers quickly after being burned. Feral animals provide new areas for establishment by disturbing and opening areas in native vegetation (Cuddihy and Stone 1990, pp. 82-83). Chemical control methods are used currently, and no known biocontrol research is being conducted for this species (Motooka *et al.* 2003).

Tibouchina herbacea, a member of the Melastomataceae family, is native to southern Brazil, Uruguay, and Paraguay. In Hawaii, it is naturalized and abundant in disturbed mesic to wet forest on the islands of Hawaii, Maui, and Lanai (Wagner *et al.* 1999, p. 915). All members of this genus are legally declared noxious in the state of Hawaii (Hawaii Administrative Rules, Title 4, Chapter 68). Research is ongoing for biological controls of this species (Smith 1998; The Nature Conservancy 2003, p. 8).

The original native flora of Hawaii consisted of about 1,400 species, nearly 90 percent of which were endemic. Of the current total native and naturalized Hawaiian flora of 1,817 taxa, 47 percent are introduced species, and nearly 100 species are pests (Smith 1985, p. 180; Wagner *et al.* 1999, p. 45). Confirmed personal observations (HBMP 2008) and several studies (Cuddihy and Stone 1990, p. 74; Robichaux *et al.* 1998, p. 4) indicate nonnative plant species may outcompete native plants similar to *Cyanea tritomantha*. Competition may be for space, light, water, or nutrients, or there may be a chemical produced that inhibits growth of other plants (Smith 1985, pp. 227-230; Cuddihy and Stone 1990, p. 74). In addition, nonnative pest plants found in habitat similar to that of this species have been shown to make the habitat less suitable for native species (Smith 1985, pp. 240-241; Loope and Medeiros 1992, pp. 7-8; Medeiros *et al.* 1992, p. 30; Ellshoff *et al.* 1995, pp. ii, 3-4; Meyer and Florence 1996, p. 778; Medeiros *et al.* 1997, pp. 23-24; Loope *et al.* 2004, p. 1,472). In particular, alien pest plant species degrade habitat by modifying availability of light, altering soil-water regimes, modifying nutrient cycling, or altering fire characteristics of native plant communities (Smith 1985, pp. 227-230; Cuddihy and Stone 1990, p. 74; Vitousek *et al.* 1997, pp. 6-10). Because of demonstrated habitat modification and resource competition by nonnative plant species in habitat similar to the wet forest habitat of *C. tritomantha*, the Service believes nonnative plant species are a threat to this species.

Some individuals of *Cyanea tritomantha* are located near trails used by hunters, and human trampling of plants has been identified as a potential problem (J. Jacobi, USGS-BRD, pers. comm. 1996). Therefore, human trampling is a potential threat to individuals of this species near trails.

CONSERVATION MEASURES PLANNED OR IMPLEMENTED

An outplanted population of approximately 300 individuals exists within a fenced enclosure in the State's Puu Makaala NAR and an additional four plants have been outplanted into a small enclosure in the Upper Waiakea FR (Tom's Trail) (L. Perry, pers. comm. 2006). A total of 69 individuals have been outplanted successfully into a fenced enclosure in the Olaa section of Hawaii Volcanoes National Park. Ungulates have been removed from these areas, and reintroduction efforts are ongoing (L. Pratt, pers. comm. 2007; T. Belfield, pers. comm. 2007; HBMP 2008).

There is an ex situ collection of this species at Hawaii Volcanoes National Park and at the Volcano Rare Plant Facility (VRPF) (P. Moriyasu, VRPF, pers. comm. 2007; Service 2005). Individuals of *Cyanea tritomantha* in propagation at the VRPF have observed to produce few seeds with low viability (P. Moriyasu, pers. comm. 2009).

SUMMARY OF THREATS

Based on our evaluation of habitat degradation and loss by feral pigs and cattle, competition with nonnative plants, and possible predation by feral pigs, cattle, rats, and slugs, we conclude there is sufficient information to develop a proposed listing rule for this species due to the present and threatened destruction, alteration, or curtailment of its habitat and range, and the displacement of individuals of *Cyanea tritomantha* due to competition with nonnative plants for space, nutrients, water, air, and light. Predation by feral pigs and cattle, and by rats and slugs, are all potential threats to *C. tritomantha*. Individuals of this species that occur near hunter trails are also potentially threatened by human trampling. We find that this species is warranted for listing throughout all its range, and, therefore, find that it is unnecessary to analyze whether it is threatened or endangered in a significant portion of its range.

RECOMMENDED CONSERVATION MEASURES

- Protect all individuals from feral pigs and cattle
- Control alien plants
- Develop and implement control methods for slugs
- Develop and implement control methods for rats
- Protect from human trampling
- Conduct/update field surveys at known locations and in suitable habitat
- Reintroduce individuals into suitable habitat within historic range that is being managed for known threats to this species
- Investigate low seed production and poor viability
- Propagate and maintain genetic stock

LISTING PRIORITY

THREAT			
Magnitude	Immediacy	Taxonomy	Priority
High	Imminent	Monotypic genus	1
		Species	2*
	Non-imminent	Subspecies/population	3
		Monotypic genus	4
		Species	5
		Subspecies/population	6
Moderate to Low	Imminent	Monotypic genus	7
		Species	8
		Subspecies/population	9
	Non-imminent	Monotypic genus	10
		Species	11
		Subspecies/population	12

Rationale for listing priority number:

Magnitude:

This species is highly threatened by feral pigs and cattle that degrade and destroy habitat, and by nonnative plants that compete for light, space, and nutrients. Potential threats to this species also include predation by feral pigs, cattle, rats, and slugs that may directly prey upon individuals, and human trampling of individuals located near trails. These threats to montane and lowland wet forest habitat of *Cyanea tritomantha*, and to individuals of this species, occur throughout its range and are expected to continue or increase without control or eradication. Only three artificially-propagated outplanted populations, numbering approximately 370 individuals, are currently protected from these threats. The threats to the remaining wild individuals are not currently managed.

Immediacy of Threats:

Threats to *Cyanea tritomantha* including habitat degradation by feral pigs and cattle and competition with nonnative plants are considered imminent because they are ongoing. Predation by slugs, rats, and feral ungulates and human trampling are all potential threats and considered non-imminent.

Yes Have you promptly reviewed all of the information received regarding the species for the purpose of determining whether emergency listing is needed?

Is Emergency Listing Warranted? No. The species does not appear to be appropriate for emergency listing at this time because the immediacy of the threats is not so great as to imperil a significant proportion of the taxon within the time frame of the routine listing process. This species is being propagated and has been outplanted into exclosures at Hawaii Volcanoes National Park, and in the State's Puu Makaala NAR and Waiakea FR. Ungulate exclosure fences and weed control in these areas provide protection for these outplanted populations. If it becomes apparent that the routine listing process is not sufficient to prevent further losses that may result in this species' extinction, then the emergency rule process for this species will be initiated. We will continue to monitor the status of *C. tritomantha* as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures.

DESCRIPTION OF MONITORING

Much of the information on this form is based on the results of a meeting of 20 botanical experts held by the Center for Plant Conservation in December of 1995, and was updated with information obtained from personal communication with Jim Jacobi and Rick Warshauer, USGS-BRD in 1996, Steve Perlman, NTBG, 1994 and 1996; Bill Garnett, botanical consultant, in 1995; Joel Lau, HNHP, in 1994; Loyal Mehrhoff, Service, in 1994; and Alvin Yoshinaga of Lyon Arboretum in 1995. We have incorporated additional information on this species from our files and the most recent supplement to the *Manual of Flowering Plants of Hawaii* (Wagner and Herbst 2003). In 2006 we received no new information on this taxon. New status information was provided in 2007 by Thomas Belfield (NPS), Patty Moriyasu (VRPF), Jack Jeffrey (Service), and Linda Pratt (USGS-BRD). In 2008, new information was provided by Linda Pratt. In 2009 we received new information from Patrice Moriyasu, VRPF. In 2010, we contacted the species experts listed below and received new information from N. Agorastos (DOFAW) and S.

Perlman (NTBG).

List all experts contacted:

Name	Date	Affiliation
Agorastos, Nick	02/09/10	Division of Forestry and Wildlife
Anderson, Stephen	02/09/10	National Park Service, Haleakala NP, Maui
Aruch, Sam	02/09/10	private contractor
Bakutis, Ane	02/09/10	Plant Extinction Prevention Program, Molokai
Ball, Donna	02/09/10	U.S. FWS, Partners Program, Hawaii Island
Beavers, Sally	02/09/10	National Park Service, Hawaii Island
Bily, Pat	02/09/10	The Nature Conservancy, Maui
Bio, Kealii	02/09/10	Plant Extinction Prevention Program, Hawaii Island
Brosius, Chris	02/09/10	West Maui Mountains Watershed Partnership
Caraway, Vickie	02/09/10	Hawaii Division of Forestry and Wildlife, Oahu
Ching, Susan	02/09/10	Plant Extinction Prevention Program, Oahu
Cole, Colleen	02/09/10	Three Mountain Alliance
Conry, Paul	02/09/10	Hawaii Department of Land and Natural Resources
Coordinator	02/09/10	East Maui Watershed Partnership
Duvall, Fern	02/09/10	Hawaii Division of Forestry and Wildlife, Maui
Fay, Kerri	02/09/10	The Nature Conservancy, Maui
Garnett, Bill	02/09/10	National Park Service, Kalaupapa, Molokai
Giffin, Jon	02/09/10	The Nature Conservancy, Hawaii Island
Haus, Bill	02/09/10	National Park Service, Haleakala NP, Maui
Higashino, Jennifer	02/09/10	U.S. FWS, Maui
Imada, Clyde	02/09/10	Bishop Museum
Jacobi, Jim	02/09/10	U.S.G.S., Biological Resources Division
Kawakami, Galen	02/09/10	Division of Forestry and Wildlife, Kauai
Kawelo, Kapua	02/09/10	U.S. Army, Environmental Division
Kier, Matt	02/09/10	U.S. Army, Environmental Division
Kiyabu, Brian	02/09/10	Amy Greenwell Botanical Garden
Kraus, Jim	02/09/10	U.S. FWS, Hakalau NWR
Medeiros, Arthur	02/09/10	U.S. Geological Survey
Misaki, Ed	02/09/10	The Nature Conservancy, Molokai
Moriyasu, Patty	02/09/10	Volcano Rare Plant Facility, Hawaii Island
Moses, Wailana	02/09/10	The Nature Conservancy, Molokai
Nakai, Glynnis	02/09/10	U.S. FWS, Refuges, Maui
Oppenheimer, Hank	02/09/10	Plant Extinction Prevention Program, Maui Nui
Palomino, Anna	02/09/10	Olinda Rare Plant Nursery, Maui
Palumbo, David	02/09/10	National Park Service, Haleakala NP, Maui
Pepi, Vanessa	02/09/10	U.S. Navy, Environmental Contractor
Perlman, Steve	02/09/10	National Tropical Botanical Garden
Perry, Lyman	02/09/10	Division of Forestry and Wildlife, Hawaii Island
Plunkett, Bryan	02/09/10	Lanai Forest and Watershed Partnership
Pratt, Linda	02/09/10	U.S.G.S., Biological Resources Division
Purell, Melora	02/09/10	Kohala Watershed Partnership

Seidman, Stephanie	02/09/10	Maui Nui Botanical Garden
Shishido, Glenn	02/09/10	Division of Forestry and Wildlife, Maui
Silbernagle, Mike	02/09/10	U.S. FWS, Refuges, Oahu
Smith, Miranda	02/09/10	Koolau Mountains Watershed Partnership
Starr, Forest	02/09/10	U.S. Geological Survey
Tanaka, Daniel	02/09/10	Puu Kukui Watershed Preserve
Ward, Joe	02/09/10	Puu Kukui Watershed Preserve
Welton, Patti	02/09/10	National Park Service, Haleakala NP, Maui
Wood, Ken	02/09/10	National Tropical Botanical Garden
Wysong, Michael	02/09/10	DLNR Natural Area Reserves, Kauai

The Hawaii Biodiversity and Mapping Program identified this species as critically imperiled (HBMP 2006). Based on the International Union for Conservation of Nature and Natural Resources Red List of Threatened Species, this species is recognized as vulnerable. *Cyanea tritomantha* is included in the list of species in Hawaii's 2005 Comprehensive Wildlife Conservation Strategy (Mitchell *et al.* 2005, p. B 4).

COORDINATION WITH STATES

On February 11, 2010, we provided the Hawaii Division of Forestry and Wildlife with copies of our most recent candidate assessments for their review and comment. Nick Agorastos (DOFAW, Hawaii District) provided us with new information.

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APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve:

Acting Cecilia L. Bohan 5/18/10
Regional Director, Region 1, Fish and Wildlife Service Date

Ronan W. Gould
ACTING :
Director, Fish and Wildlife Service October 22, 2010

Concur:

Do not concur: _____ Date: _____
Director, Fish and Wildlife Service

Director's Remarks:

Date of annual review: _____ Date: April 5, 2010
Conducted by: Cheryl Phillipson, Pacific Islands FWO
Biologist, Prelisting and Listing Program

Comments:

PIFWO Review

Reviewed by: Christa Russell Date: April 22, 2010
Prelisting and Listing Program Coordinator

Marilet Zablan Date:
Assistant Field Supervisor, Endangered Species Division

Gina Shultz Date: _____
Acting Field Supervisor